SM70

TS100/TS200 Series
PA Speakers

INSTALLATION AND OPERATION MANUAL

REV 4.00 March 22, 2005

Northern Airborne Technology Ltd.
1925 Kirschner Road
Kelowna, BC, Canada.
V1Y 4N7

Telephone (250) 763-2232
Facsimile (250) 762-3374

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IMPORTANT INFORMATION

This manual has been produced to provide information unique to the TS100/TS200 Series PA Speakers. Some of this information has been published previously in the SM02 Service manual (AA20/22/23 PA110/220 Series Loudhailer/PA Systems).

The information presented in this manual is for reference purposes only, and is intended to provide general information that can be used by the installer/technician to gain a fundamental understanding of the product. Information for specific units can be requested by contacting the Product Support Department at NAT Ltd.

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Periodically NAT will release manual amendments. In order to maintain the most accurate and up to date manual these amendments should be carried out immediately upon receipt and recorded on the following amendment record.

AMENDMENT RECORD

Amendment Number	Amendment Date	Section(s) Changed	Date Entered	Entered By
Note: Revision 4.00 is the first public release of this document				
1	Nov 30/06	2		**Performed at factory**

Insert any Amendment Instruction sheets after this page.

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INSTALL_OPS
MANUAL AMENDMENT

Manual: SM70 (TS100_TS200)	**Amendment #: 1**
Document # SM70\Install_Ops\809-0001	**Amendment Date:** Nov 30, 2006

The purpose of this amendment is to add drawings to the manual.

Amendment Instructions:

1

Remove Pages	Replace With Pages
2-3 Rev 4.00	2-3 to 2-4 Rev 4.00 Amendment 1

2

Remove Drawings (Section 2)	Replace or add Drawings (Section 2)
-	TS100WR\403-0 Rev 1.00
-	TS100WR\405-0 Rev 1.00
TS200WR\403-0 Rev 1.00	TS200WR\403-0 Rev 1.10
TS200WR\403-1 Rev 1.00	TS200WR\403-1 Rev 1.10
TS200WR\405-0 Rev 1.01	TS200WR\405-0 Rev 1.10

Note: Ensure that all drawings are inserted in the order shown on the latest drawing lists.

3 Update the Amendment Record sheet at the front of the manual.

4 Insert this page into the manual after the Amendment Record sheet (page iii).

Manual Amendment ends after the following amended pages

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Table of Contents

Section	Title	Page
1	Description	
1.1	Introduction	1-1
1.2	Purpose of Equipment	1-1
1.3	Features	1-1
1.4	Specifications	1-1
1.4.1	Performance Specifications	1-1
1.4.2	Physical Specifications	1-1
1.5	System Configuration	1-2
2	Installation	
2.1	Introduction	2-1
2.2	Unpacking and Inspection	2-1
2.3	Installation Procedures	2-1
2.3.1	Warnings	2-1
2.3.2	Cautions	2-1
2.3.3	Cabling and Wiring	2-2
2.3.4	Mechanical Installation	2-2
2.3.5	Post-Installation Checks	2-2
2.4	Continued Airworthiness	2-2
2.5	Installation Drawings	2-2
2.5.1	Reference Drawings	2-3
3	Operation	
3.1	Introduction	3-1
3.2	General	3-1
3.3	Operation Specifics	3-1
3.3.1	Cautions	3-1

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Section 1 Description

1.1 Introduction

This manual contains information on the TS100WR and TS200WR PA Speakers. Some TS100/TS200 Series PA Speakers information will also be provided for reference only.

Information in this section consists of purpose of equipment, features and specifications.

1.2 Purpose of Equipment

The TS100 and TS200 Series PA Speakers are lightweight loudspeakers that can be used for both internal and external aircraft applications. The TS100WR/TS200WR Series PA Speakers are used with the PA110, PA220 and PA250 series amplifiers.

1.3 Features

This series of speakers offers full 100- and 200-watt capability, and the driver assembly and mechanical parts are field replaceable for ease of maintenance.

1.4 Specifications

1.4.1 Performance Specifications

Loudhailer	Input Power	Impedance	Frequency	Output Level @ 1m
TS100 (S-100S)	100 Wrms	11 Ohms	275 – 8000 Hz	116 dB (1 W, 1500 Hz signal)
TS100S (S-100R)	100 Wrms	11 Ohms	275 – 8000 Hz	114 dB (1 W, 1200 Hz signal)
TS100R (SD-210R)	100 Wrms	11 Ohms	275 – 7000 Hz	110 dB (1 W, 1000 Hz signal)
TS100A	100 Wrms	11 Ohms	275 – 7000 Hz	110 dB (1 W, 1000 Hz signal)
TS100WR	100 Wrms	11 Ohms	275 – 7000 Hz	110 dB (1 W, 1000 Hz signal)
TS200	100 Wrms	11 Ohms	275 – 7000 Hz	110 dB (1 W, 1000 Hz signal)
TS200WR	100 Wrms	11 Ohms	275 – 7000 Hz	110 dB (1 W, 1000 Hz signal)

Note: These specifications are given for guidance only. If further information is required, please contact the Product Support department at NAT.

1.4.2 Physical Specifications

See the appropriate **Mechanical Installation** drawings (922-0) in Section 2 of this manual for the PA Speaker physical specifications.

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1.5 System Configuration

The TS100/TS200 PA Speaker should be chosen to match the audio output power of the PA System amplifier. As a general rule, the system should have one speaker driver (minimum) for each 100 watts of audio power.

Failure to follow this rule can result in the speakers being overdriven, leading to high levels of distortion and premature failure of the speaker drivers.

End of section 1

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Section 2 Installation

2.1 Introduction

Information in this section consists of: unpacking and inspection procedures, installation procedures, post-installation checks, and installation drawings.

2.2 Unpacking and Inspection

Unpack the equipment carefully and locate the warranty card. Inspect the unit visually for damage due to shipping and report all such claims immediately to the carrier involved. Note that each unit should have the following:

- TS100/TS200 Series PA Speaker
- Warranty Card
- Release certification

Verify that all items are present before proceeding and report any shortage immediately to your supplier.

2.2.1 Warranty

Complete the warranty card information and send it to NAT when the installation is complete. If you fail to complete the warranty card, the warranty will be activated on date of shipment from NAT.

Note: An appropriately rated facility, e.g. Certified Aircraft Repair Station, must install this equipment in accordance with applicable regulations. NAT Ltd's warranty is not valid unless the equipment is installed by an authorized NAT Dealer. Failure to follow any of the installation instructions, or installation by a non-certified individual or agency will void the warranty, and may result in a non-airworthy installation.

2.3 Installation Procedures

2.3.1 Warnings

Stand clear, this equipment operates at an intense sound level. Personnel must be kept away from the direct loudspeaker beam.

2.3.2 Cautions

Do not operate the equipment in a hangar or in confined areas.

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Do not operate the equipment with snow, water or other foreign matter in the loudspeaker horn.

Do not clean the loudspeaker with compressed air.

Be careful only to operate the siren for 3 cycles at a time and trill for a short 2 to 3 second burst. The driver is unable to withstand constant signals – it requires a Duty cycle (see above) to permit the unit to cool down.

2.3.3 Cabling and Wiring

All unshielded wire shall be selected in accordance with AC43.13-1B Change 1, Paragraphs 11-76 through 11-78. Wire types should be to MIL-W-22759 as specified in AC43.13-1B Change 1, Paragraphs 11-85, 11-86, and listed in Table 11-11.

For shielded wire applications, use Tefzel MIL-M-27500 or MIL-M-81044 shielded wire with solder sleeves (for shield terminations) to make the most compact and easily terminated interconnect. Follow the wiring diagrams in Section 2.5 as required.

2.3.4 Mechanical Installation

The installing agency is responsible for the design, engineering and installation of the mounting bracket for the Speaker. Careful consideration should be given to the operating environment and the mechanical forces acting upon the unit.

When installing the speakers, ensure that there is adequate airflow to cool the speaker drivers, and that the speaker phasing is correct.

Note: The speakers are designed for intermittent operation only.

CAUTION

Failure to install the TS200WR speakers as shown in the relevant wiring diagram(s) will result in PERMANENT AND IRREPARABLE DAMAGE to the speaker drivers.

Both speaker drivers MUST be wired in phase to ensure proper performance and to prevent damage.

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2.3.5 Post-Installation Checks

Ensure all connectors are tight and the mechanical installation is sound.

When the PA system installation is complete, carry out a full performance test to ensure that all components of the system (including the speaker) are functioning correctly. For full post-installation check information, refer to Section 2 of **SM35**, PA110/220 High Power Audio Amplifiers Service manual.

2.4 Continued Airworthiness

Maintenance of the TS100/TS200 Series speakers is 'on condition' only. Periodic maintenance of this product is not required.

2.5 Installation Drawings

DRAWING	REV.	DESCRIPTION	TYPE
TS100WR			
TS100WR\403-0	1.00	Lightweight Speaker	Interconnect
TS100WR\405-0	1.00	Lightweight Speaker	Connector Map
TS100WR\922-0	1.10	Speaker, Lightweight	Mech. Installation
TS200WR			
TS200WR\403-0	1.10	Dual Speaker, Lightweight	Interconnect
TS200WR\403-1	1.10	Dual Speaker, Lightweight	Interconnect
TS200WR\405-0	1.10	Dual Speaker, Lightweight	Connector Map
TS200WR\922-0	1.01	Dual Speaker, Lightweight	Mech. Installation

2.5.1 Reference Drawings

The following drawings are included for reference only.

DRAWING	REV.	DESCRIPTION	TYPE
TS100			
TS100\920-0	1.00	Speaker, Lightweight	Mounting Diagram
TS100A			
TS100A\920-0	1.00	Speaker, Lightweight	Mounting Diagram
TS100A\922-0	1.10	Speaker, Lightweight	Mech. Installation
TS100RA			
TS100RA\922-0	1.10	Speaker, Lightweight	Mech. Installation

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DRAWING	REV.	DESCRIPTION	TYPE
TS200			
TS200\920-0	1.00	Dual Speaker, Lightweight	Mounting Diagram
TS200\922-0	1.00	Dual Speaker, Lightweight	Mech. Installation

Section 2 ends after these Drawings

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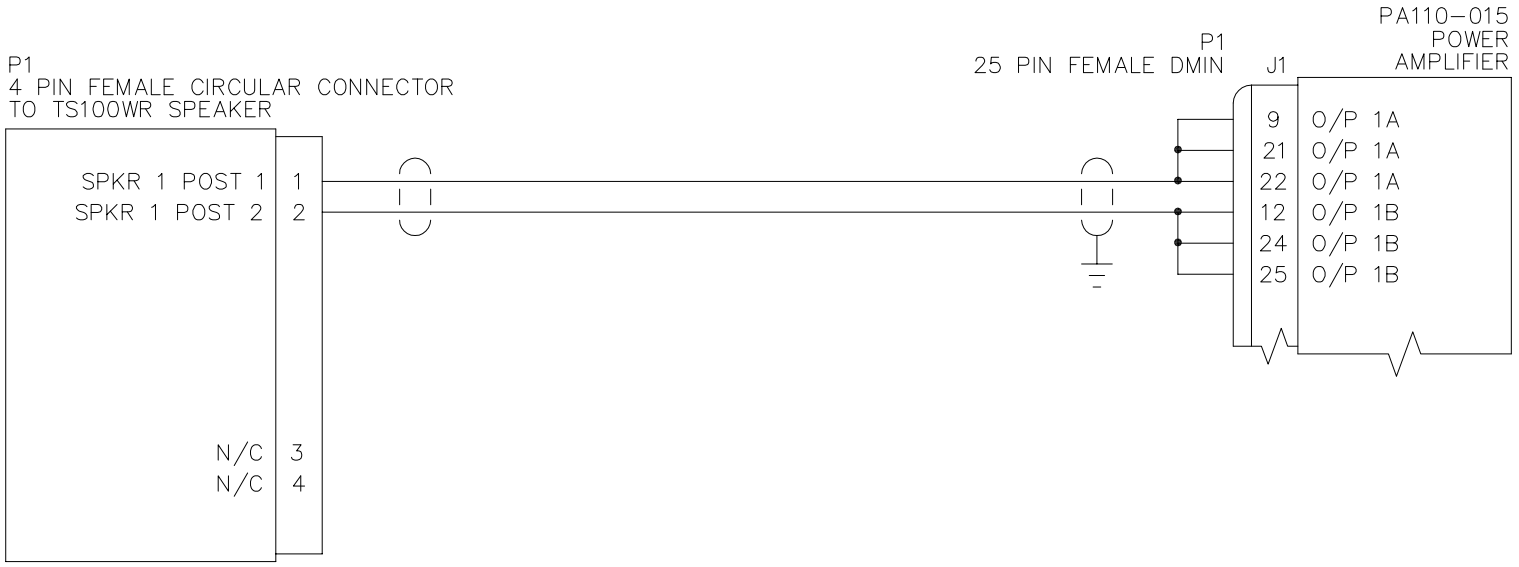

NOTES:

1. ALL WIRES SHOULD BE 16 AWG UNLESS OTHERWISE SPECIFIED. ALL UNSHIELDED WIRE SHALL BE SELECTED IN ACCORDANCE WITH AC43.13-1B CHANGE 1, PARAGRAPHS 11-76 THROUGH 11-78. WIRE TYPES SHOULD BE TO MIL-W-22759 AS SPECIFIED IN AC43.13-1B CHANGE 1, PARAGRAPHS 11-85, 11-86 AND LISTED IN TABLE 11-11. ALL SHIELDED WIRE/CABLE SHOULD BE IN ACCORDANCE WITH MIL-C-27500.

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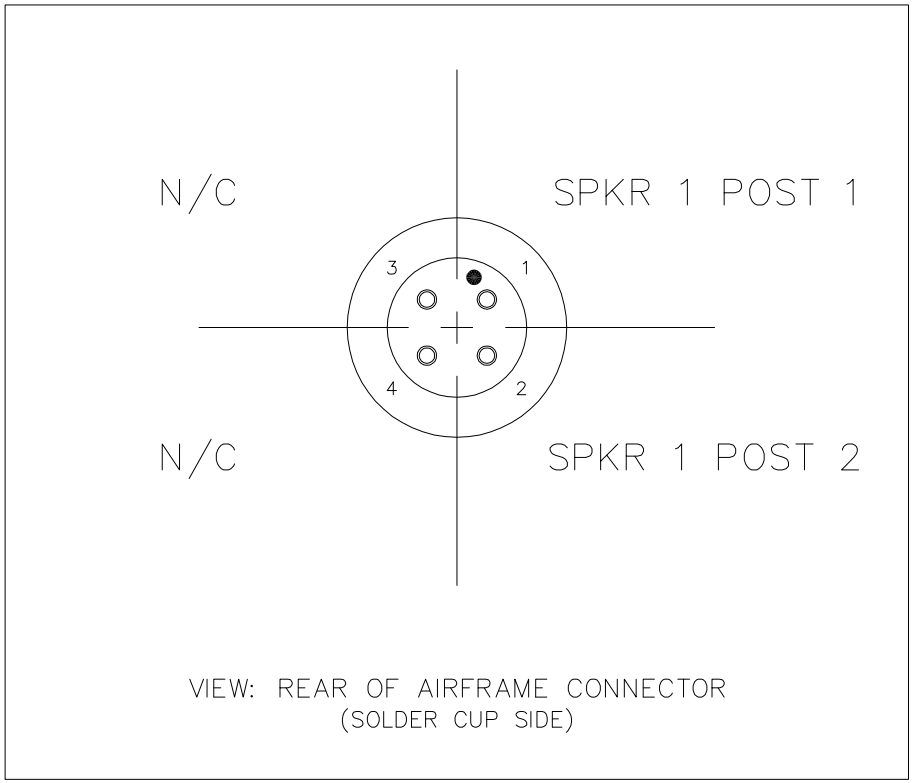
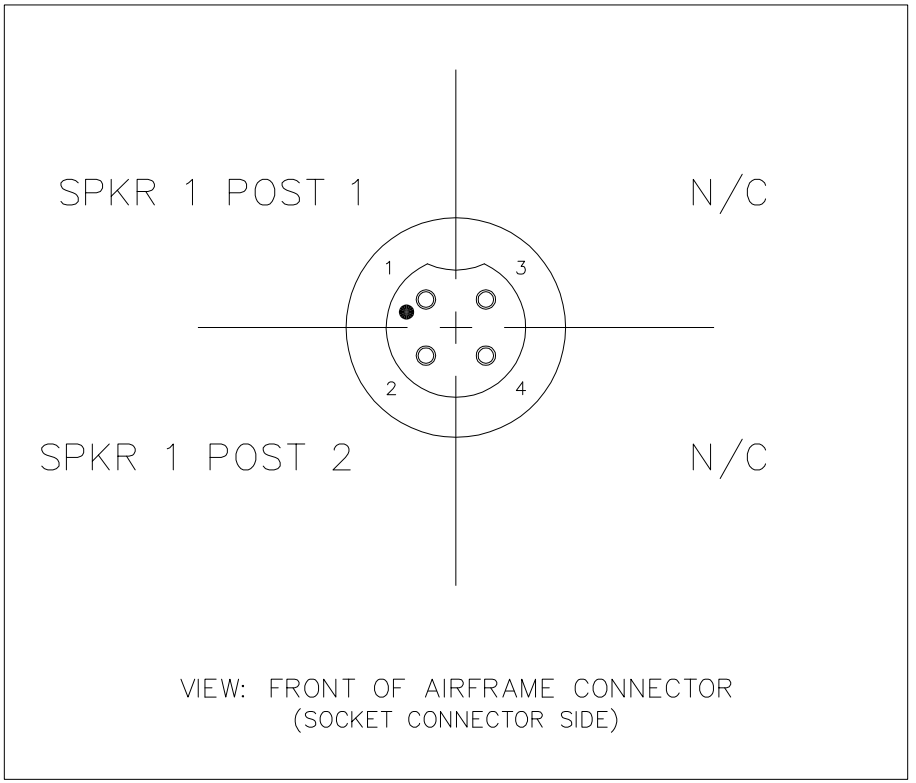
DESIGNED	DV	nat NORTHERN AIRBORNE TECHNOLOGY LTD.				
DRAWN	TAT					
DATE	OCT 17/06	TITLE LIGHTWEIGHT SPEAKER				
CHECKED	NAT 284 / NAT 255					
APPROVED	NAT 129	SIZE A	CAGE CODE 3AB01	PART NO. TS100WR	REV. 1.00	SHEET 1/1
FILE	403-0.DWG	DWG. TYPE	INTERCONNECT	DWG. NO.	TS100WR\403-0	



VIEW: REAR OF AIRFRAME CONNECTOR
(SOLDER CUP SIDE)



VIEW: FRONT OF AIRFRAME CONNECTOR
(SOCKET CONNECTOR SIDE)

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DESIGNED	DV	nat NORTHERN AIRBORNE TECHNOLOGY LTD.				
DRAWN	TAT					
DATE	OCT 16/06	TITLE	LIGHTWEIGHT SPEAKER			
CHECKED	NAT 255					
APPROVED	NAT 129	SIZE A	CAGE CODE 3AB01	PART NO. TS100WR	REV. 1.00	SHEET 1/1
FILE	405-0.DWG	DWG. TYPE	CONNECTOR MAP	DWG. NO.	TS100WR\405-0	

REVISIONS			
REV	DESCRIPTION	DATE	BY
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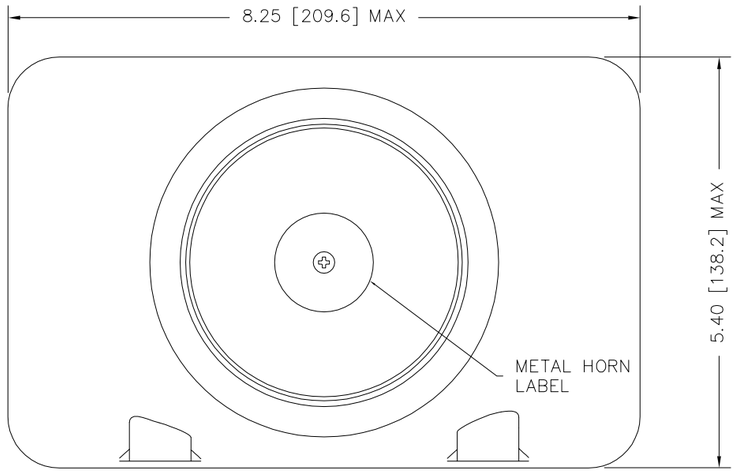
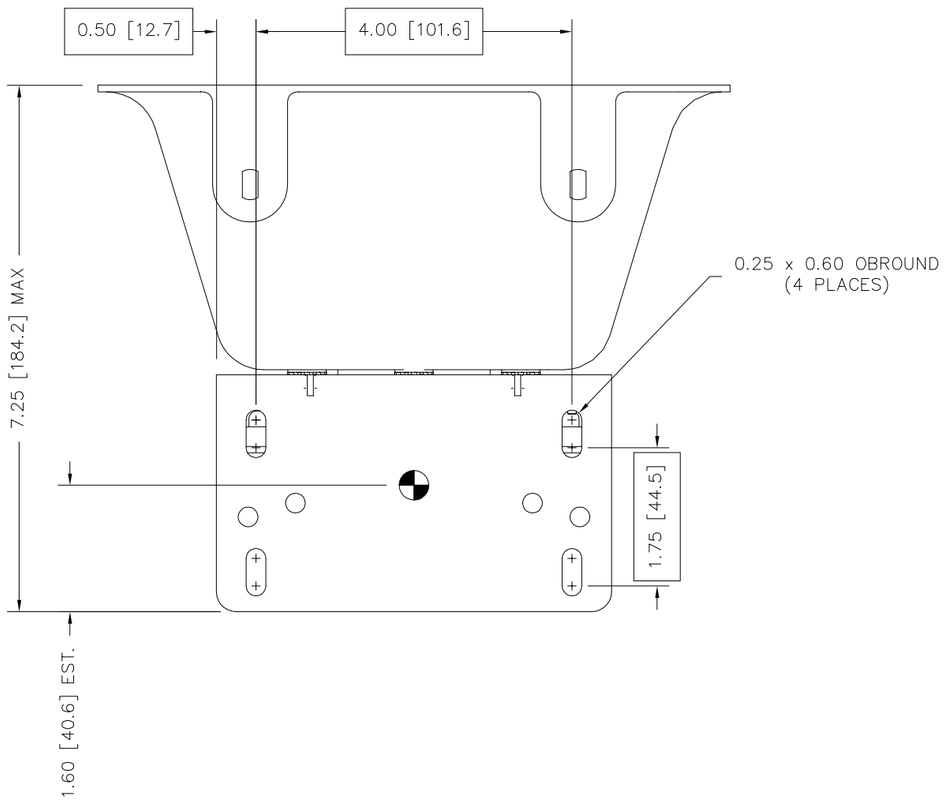
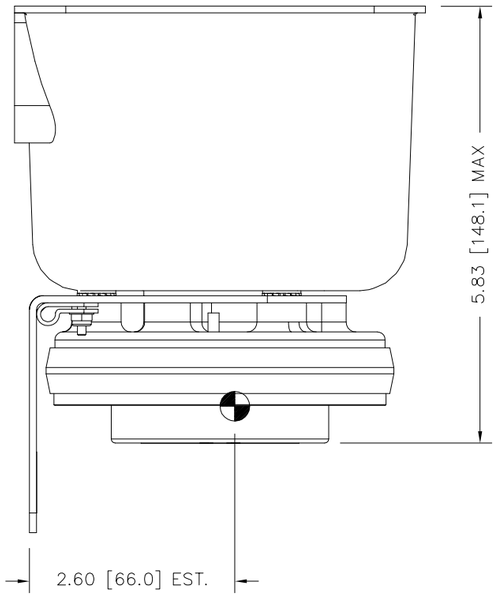
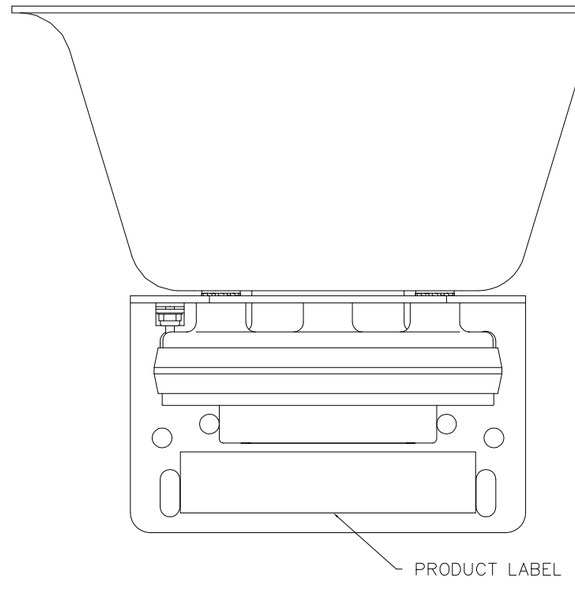
1.10	DOCCR00797 – CORRECT BASE PLATE.	MAY 26/04	TAT



CENTER OF GRAVITY







NOTES:
1. DIMENSIONING AND TOLERANCING IN ACCORDANCE WITH ASME Y14.5M–1994

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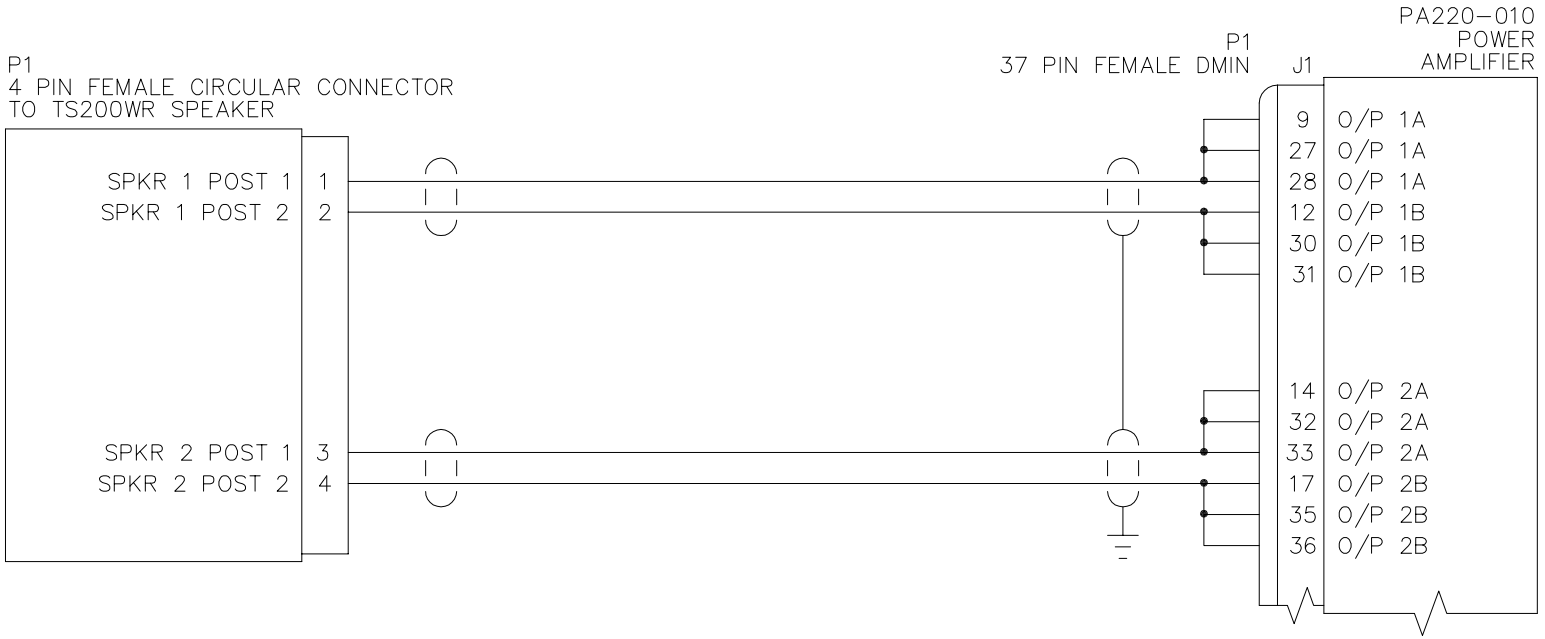
DIMENSIONS ARE INCHES [mm]	DESIGNED	–	nat NORTHERN AIRBORNE TECHNOLOGY LTD.
THIRD ANGLE PROJECTION	DRAWN	TGM/TAT	
	DATE	JUL 25/00	TITLE: SPEAKER, LIGHTWEIGHT
MASS: 3.85 lbs. (1.8 Kg) MAX	CHECKED	NAT 249	
MATERIAL: –	APPROVED	NAT 501	SIZE: B; CAGE CODE: 3AB01; PART NO.: TS100WR; REV.: 1.10; SHEET: 1/1
FINISH: –	FILE	922–0.DWG	DWG. TYPE: MECH. INSTALLATION; DWG. NO.: TS100WR\922–0

REVISIONS			
REV	DESCRIPTION	DATE	BY
1.10	DOCCR01799 – CHANGED PIN NAMES ON TS200WR P1, REVISED NOTES.	OCT 17/06	TAT



NOTES:

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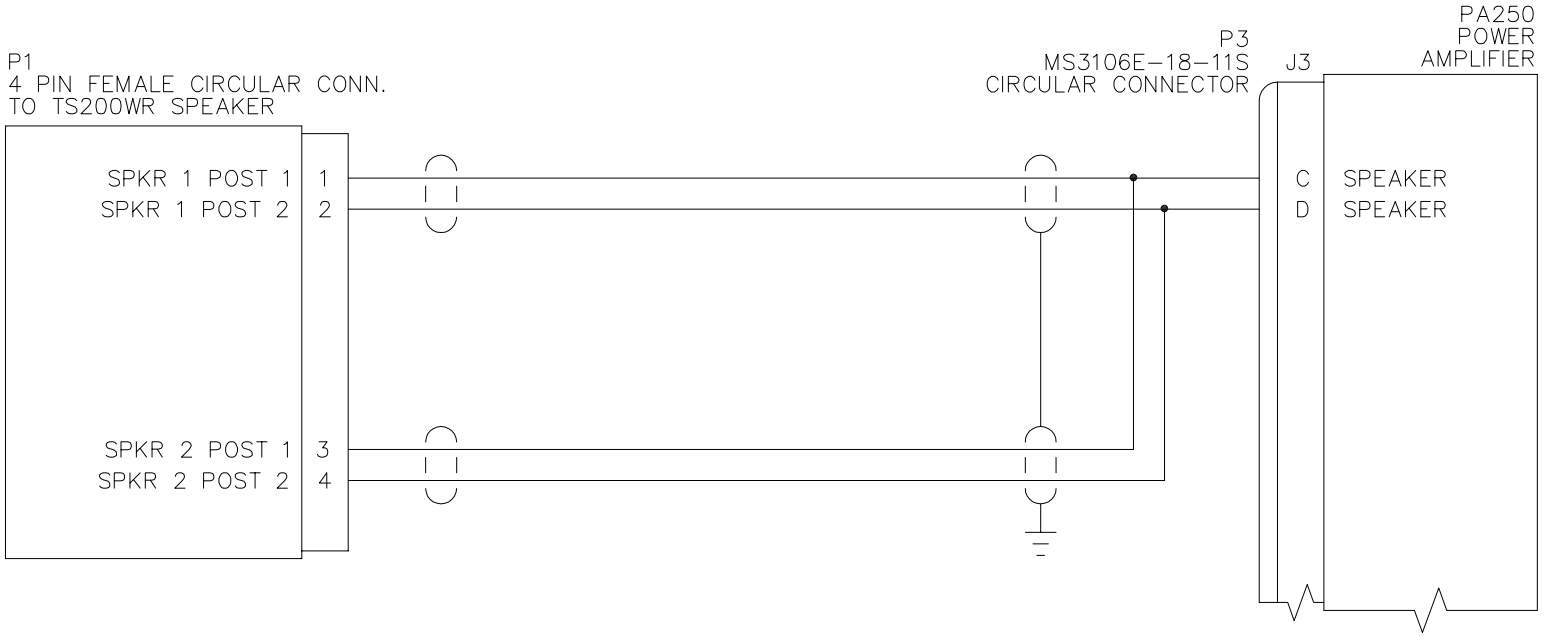
DESIGNED	DV	nat NORTHERN AIRBORNE TECHNOLOGY LTD.				
DRAWN	TAT					
DATE	FEB 27/03	TITLE	DUAL SPEAKER, LIGHTWEIGHT			
CHECKED	NAT 284 / NAT 255					
APPROVED	NAT 131	SIZE A	CAGE CODE 3AB01	PART NO. TS200WR	REV. 1.10	SHEET 1/2
FILE	403–0.DWG	DWG. TYPE	INTERCONNECT	DWG. NO.	TS200WR\403–0	



NOTES:

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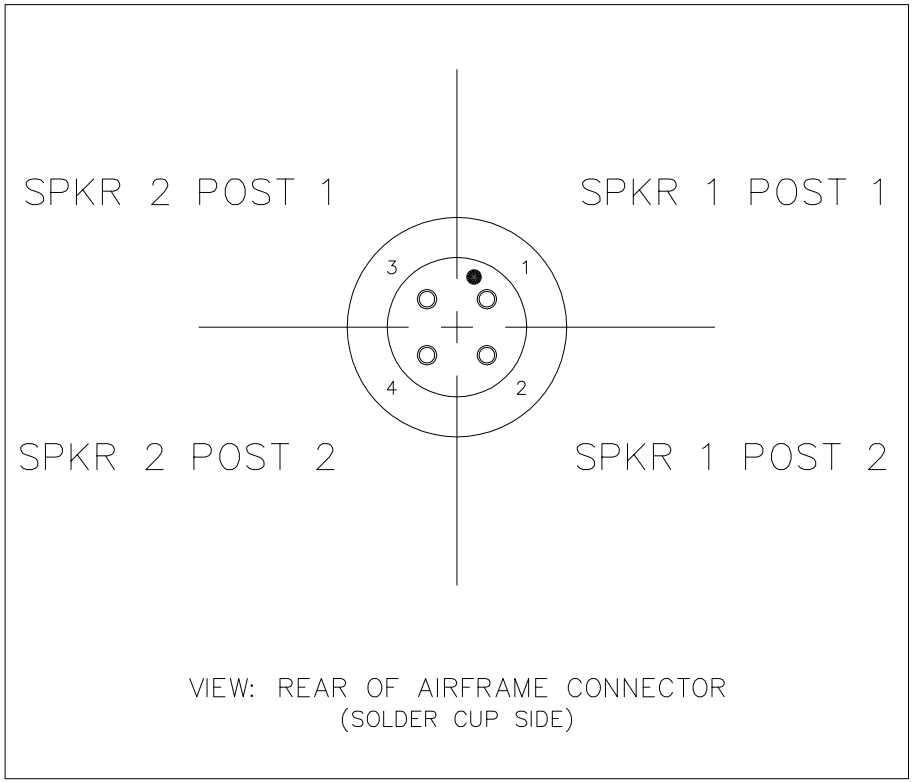
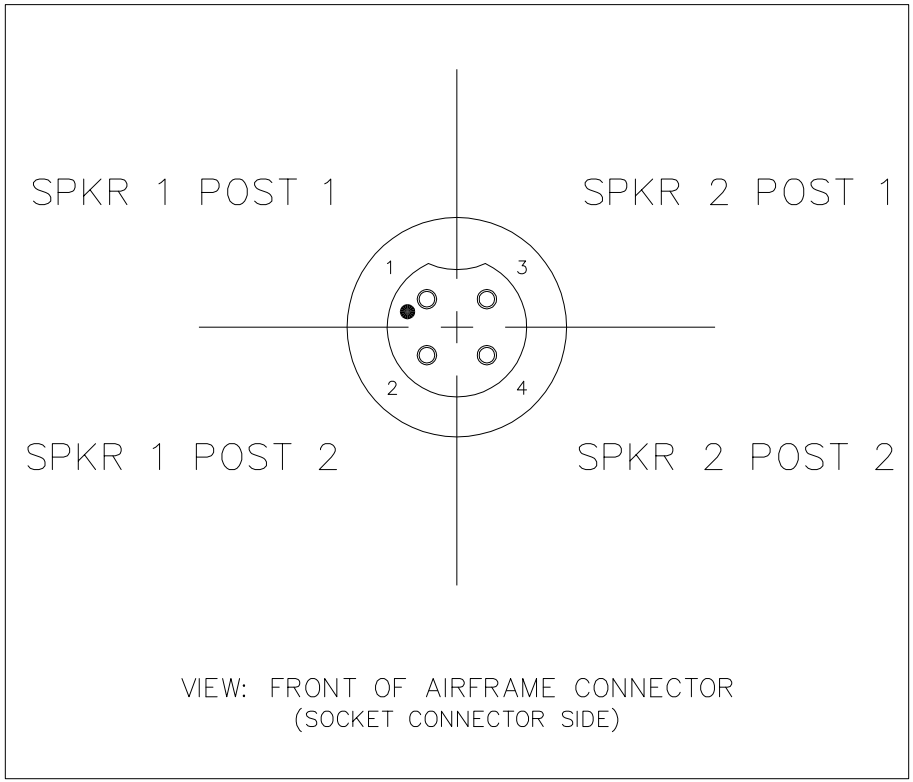
DESIGNED	DV	nat NORTHERN AIRBORNE TECHNOLOGY LTD.				
DRAWN	TAT					
DATE	FEB 27/03	TITLE	DUAL SPEAKER, LIGHTWEIGHT			
CHECKED	NAT 284 / NAT 255					
APPROVED	NAT 131	SIZE A	CAGE CODE 3AB01	PART NO. TS200WR	REV. 1.10	SHEET 2/2
FILE	403-0.DWG	DWG. TYPE	INTERCONNECT	DWG. NO.	TS200WR\403-1	

REVISIONS			
REV	DESCRIPTION	DATE	BY
1.01	DOCCR01003 – ADDED FRONT OF AIRFRAME CONNECTOR VIEW.	OCT 26/04	MWS
1.10	DOCCR01799 – CHANGED PIN NAMES.	OCT 16/06	TAT



VIEW: REAR OF AIRFRAME CONNECTOR
(SOLDER CUP SIDE)



VIEW: FRONT OF AIRFRAME CONNECTOR
(SOCKET CONNECTOR SIDE)

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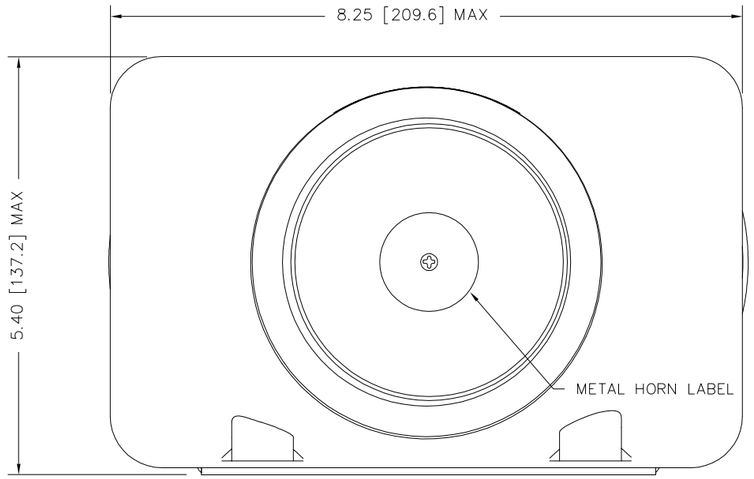
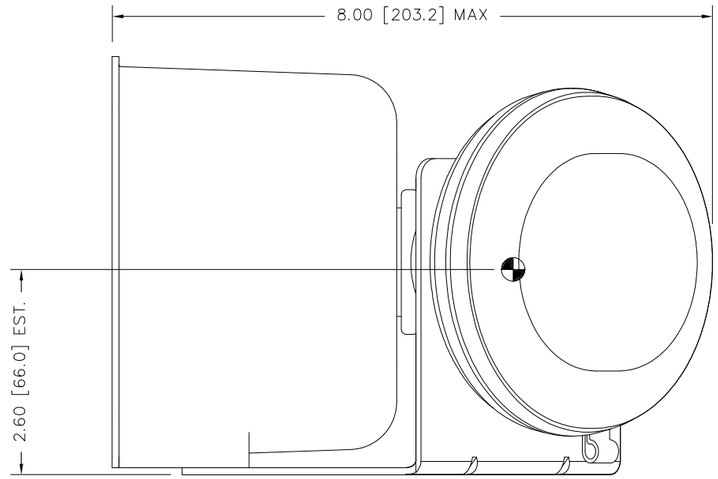
DESIGNED	DV	nat NORTHERN AIRBORNE TECHNOLOGY LTD.				
DRAWN	TAT					
DATE	FEB 27/03	TITLE	DUAL SPEAKER, LIGHTWEIGHT			
CHECKED	NAT 255					
APPROVED	NAT 131	SIZE A	CAGE CODE 3AB01	PART NO. TS200WR	REV. 1.10	SHEET 1/1
FILE	405–0.DWG	DWG. TYPE	CONNECTOR MAP	DWG. NO.	TS200WR\405–0	

REVISIONS			
REV	DESCRIPTION	DATE	BY
1.01	ECR #1848 – FORMAT CHANGES.	APR 26/02	TAT





CENTER OF GRAVITY

NOTES:
1. DIMENSIONING AND TOLERANCING IN ACCORDANCE WITH ASME Y14.5M–1994

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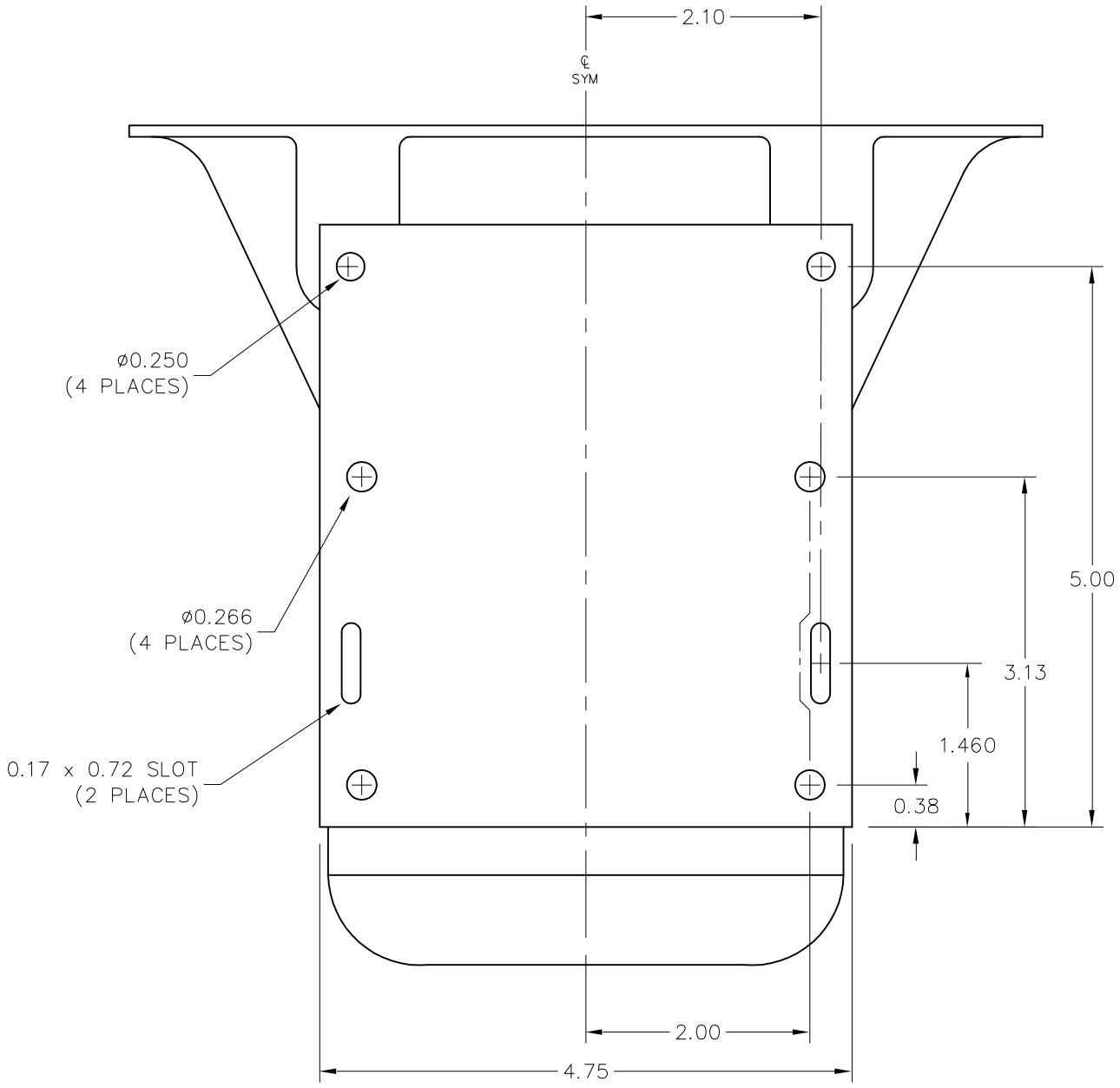
DIMENSIONS ARE INCHES [mm]	DESIGNED	–	nat NORTHERN AIRBORNE TECHNOLOGY LTD.
THIRD ANGLE PROJECTION	DRAWN	TGM/TAT	
	DATE	JUL 25/02	TITLE: DUAL SPEAKER, LIGHTWEIGHT
MASS: 6.60 lbs. (3.0 Kg) MAX	CHECKED	NAT PROD 112 NAT 255	
MATERIAL –	APPROVED	NAT 104	SIZE B · CAGE CODE 3AB01 · PART NO. TS200WR · REV. 1.01 · SHEET 1/1
FINISH –	FILE 922–0101.DWG	DWG. TYPE MECH. INSTALLATION	DWG. NO. TS200WR\922–0



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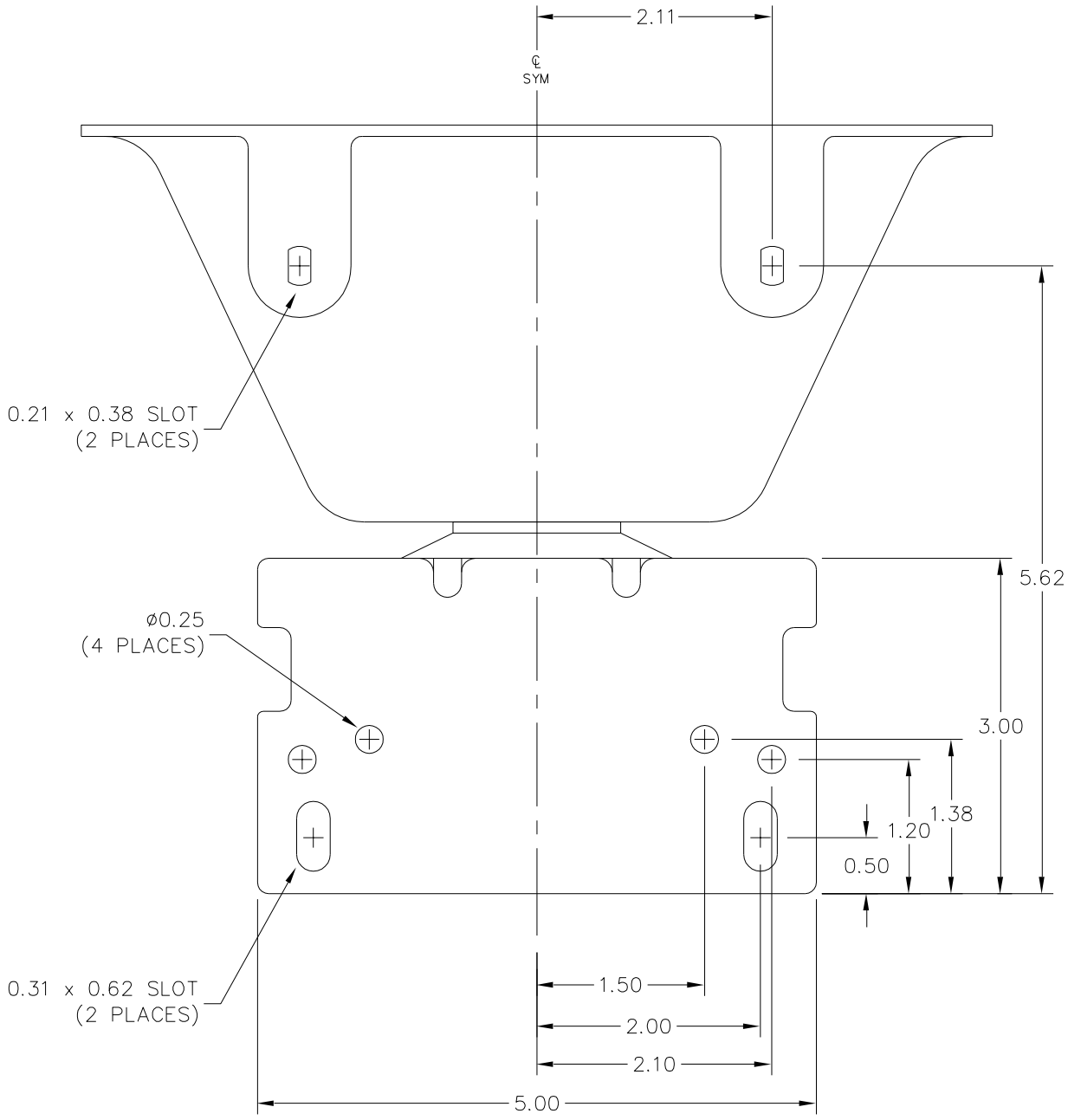
TOLERANCES UNLESS STATED OTHERWISE 0.X=+/−0.030 0.XX=+/−0.010 0.XXX=+/−0.005 0.XXXX=+/−0.002 ANGLE=+/− 0.5 DEG.	DIMENSIONS IN INCHES THIRD ANGLE PROJECTION	DESIGNED	SW	nat NORTHERN AIRBORNE TECHNOLOGY LTD.			
		DRAWN	TGM				
		DATE	MAY 21/97	TITLE	EXTERNAL SPEAKER		
		CHECKED	NAT PROD. 112				
MATERIAL		APPROVED	NAT 107	SIZE A	CAGE CODE 3AB01	PART NO. TS100	REV. 1.00 / SHEET 1/1
FINISH		FILE 920−0100.DWG		DWG. TYPE MOUNTING		DWG. NO. TS100\920−0	



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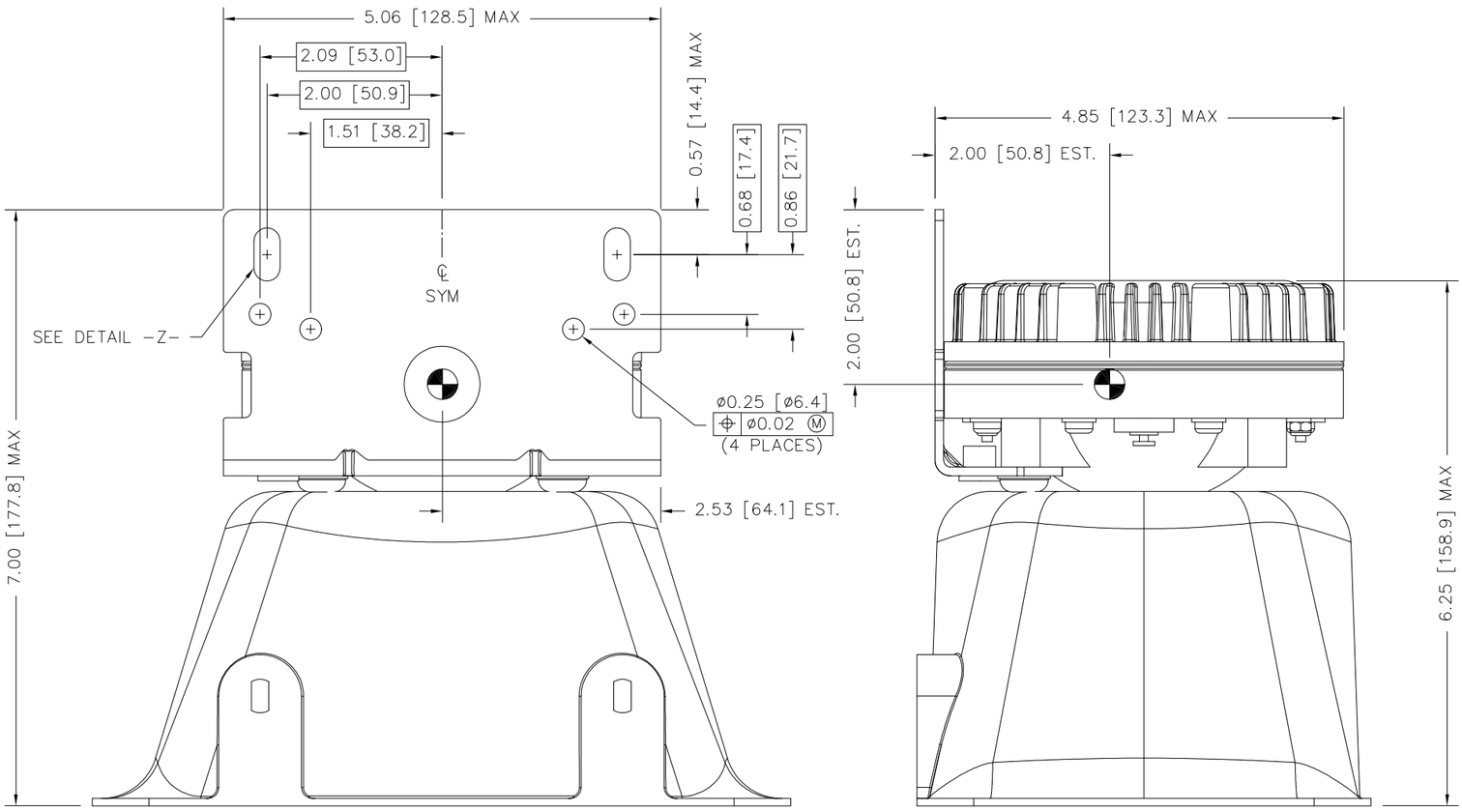
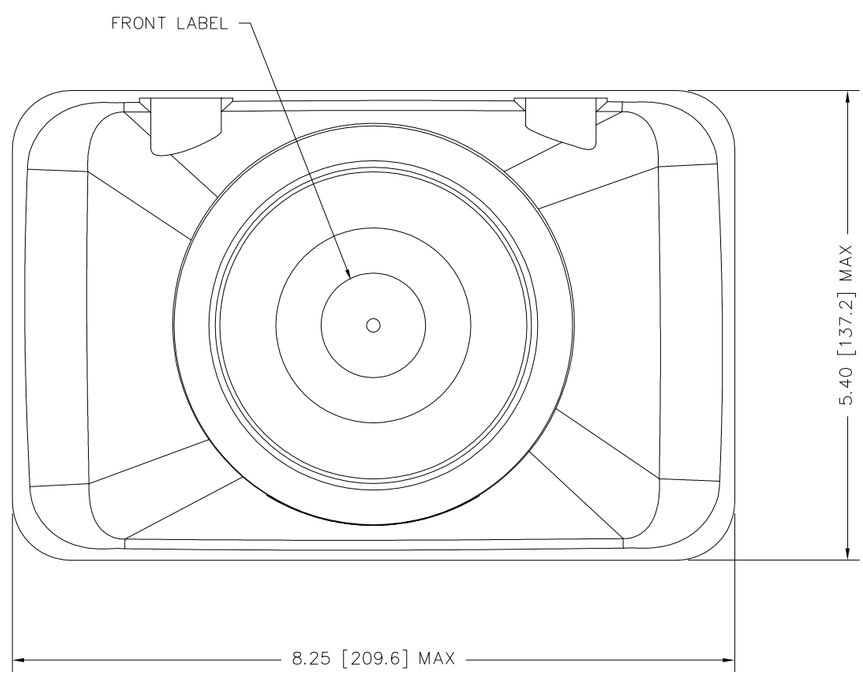
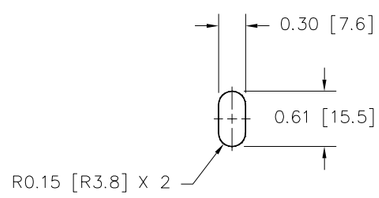
TOLERANCES UNLESS STATED OTHERWISE 0.X=+/−0.030 0.XX=+/−0.010 0.XXX=+/−0.005 0.XXXX=+/−0.002 ANGLE=+/− 0.5 DEG.	DIMENSIONS IN INCHES THIRD ANGLE PROJECTION	DESIGNED	SW	nat NORTHERN AIRBORNE TECHNOLOGY LTD.			
		DRAWN	TGM				
		DATE	MAY 9/97	TITLE	EXTERNAL SPEAKER		
		CHECKED	NAT PROD. 112				
MATERIAL		APPROVED	NAT 107	SIZE A	CAGE CODE 3AB01	PART NO. TS100A	REV. 1.00 / SHEET 1/1
FINISH		FILE 920−0100.DWG		DWG. TYPE MOUNTING		DWG. NO. TS100A\920−0	

REVISIONS			
REV	DESCRIPTION	DATE	BY
1.10	ECR #2184 – SUPPLIER CHANGED SPEAKER DRIVER.	JUL 10/02	MWS







DETAIL –Z–
(2 PLACES)

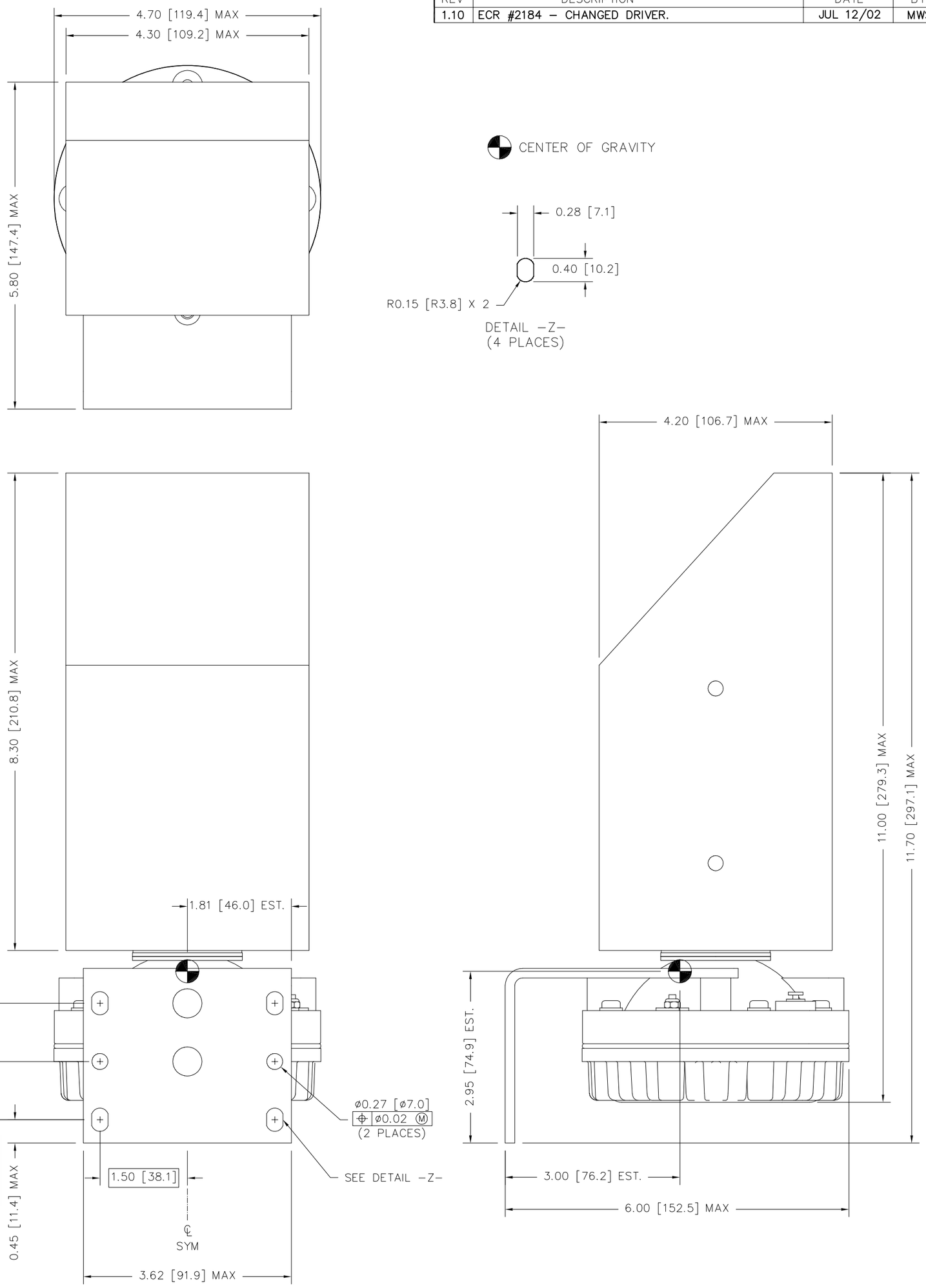
CENTER OF GRAVITY

NOTES:
1. DIMENSIONING AND TOLERANCING
IN ACCORDANCE WITH ASME Y14.5M–1994

CONFIDENTIAL AND PROPRIETARY TO NAT LTD.

DIMENSIONS ARE INCHES [mm]	DESIGNED	–	nat NORTHERN AIRBORNE TECHNOLOGY LTD.
	DRAWN	TAT	
THIRD ANGLE PROJECTION	DATE	FEB 18/00	TITLE: SPEAKER
MASS: 5.5 lbs. (2.5 kg) MAX	CHECKED	NAT 241	
MATERIAL –	APPROVED	NAT 113	SIZE B | CAGE CODE 3AB01 | PART NO. TS100A | REV. 1.10 | SHEET 1/1
FINISH –	FILE 922–0110.DWG	DWG. TYPE MECH. INSTALLATION	DWG. NO. TS100A\922–0

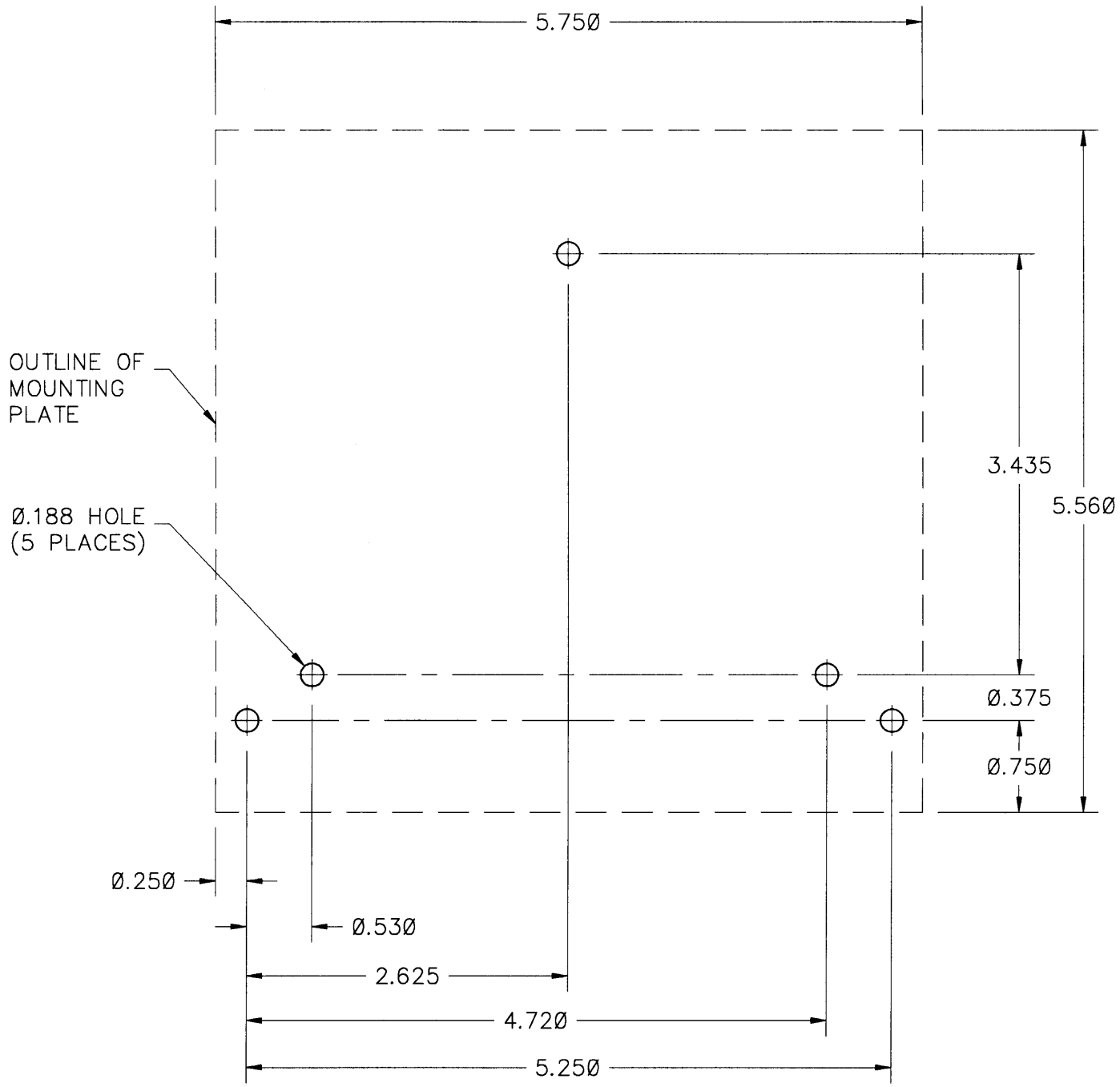
REVISIONS			
REV	DESCRIPTION	DATE	BY
1.10	ECR #2184 – CHANGED DRIVER.	JUL 12/02	MWS



NOTES:
1. DIMENSIONING AND TOLERANCING IN ACCORDANCE WITH ASME Y14.5M–1994

CONFIDENTIAL AND PROPRIETARY TO NAT LTD.

DIMENSIONS ARE INCHES [mm]	DESIGNED	–	nat NORTHERN AIRBORNE TECHNOLOGY LTD.
THIRD ANGLE PROJECTION	DRAWN	MWS	
	DATE	AUG 11/00	TITLE: EXTERNAL HORN, RIGHT ANGLE, 100 WATT
MASS: 7.00 lbs. (3.2 kg) MAX	CHECKED	NAT 241	
MATERIAL: –	APPROVED	NAT 113	SIZE: B; CAGE CODE: 3AB01; PART NO.: TS100–RA; REV.: 1.10; SHEET: 1/1
FINISH: –	FILE: 922–0110.DWG	DWG. TYPE: MECH. INSTALLATION	DWG. NO.: TS100–RA\922–0



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REVISION	DATE
1.00	JAN 25/95

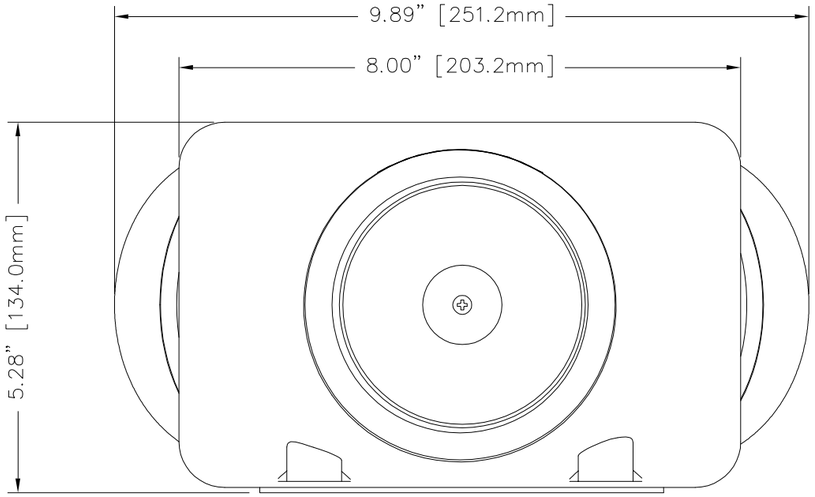
TOLERANCES UNLESS STATED OTHERWISE
0.X=+/−0.030 DIM. IN INCHES
0.XX=+/−0.010
0.XXX=+/−0.005
0.XXXX=+/−0.002
ANGLE=+/− 0.5 DEG.

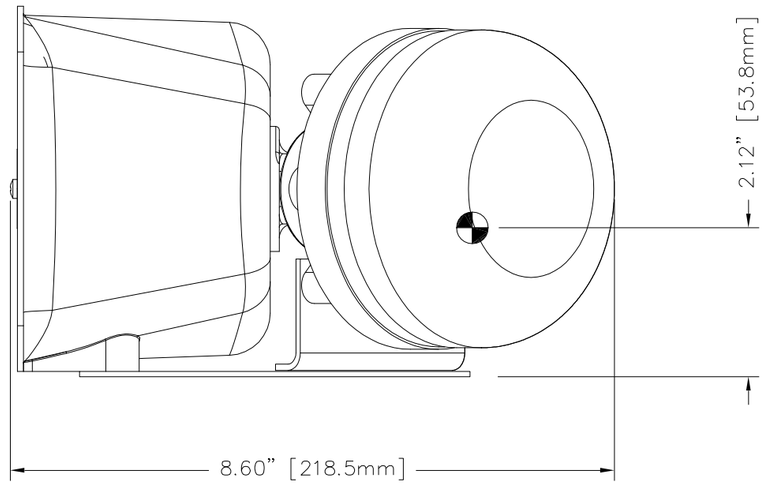
THIRD ANGLE PROJECTION

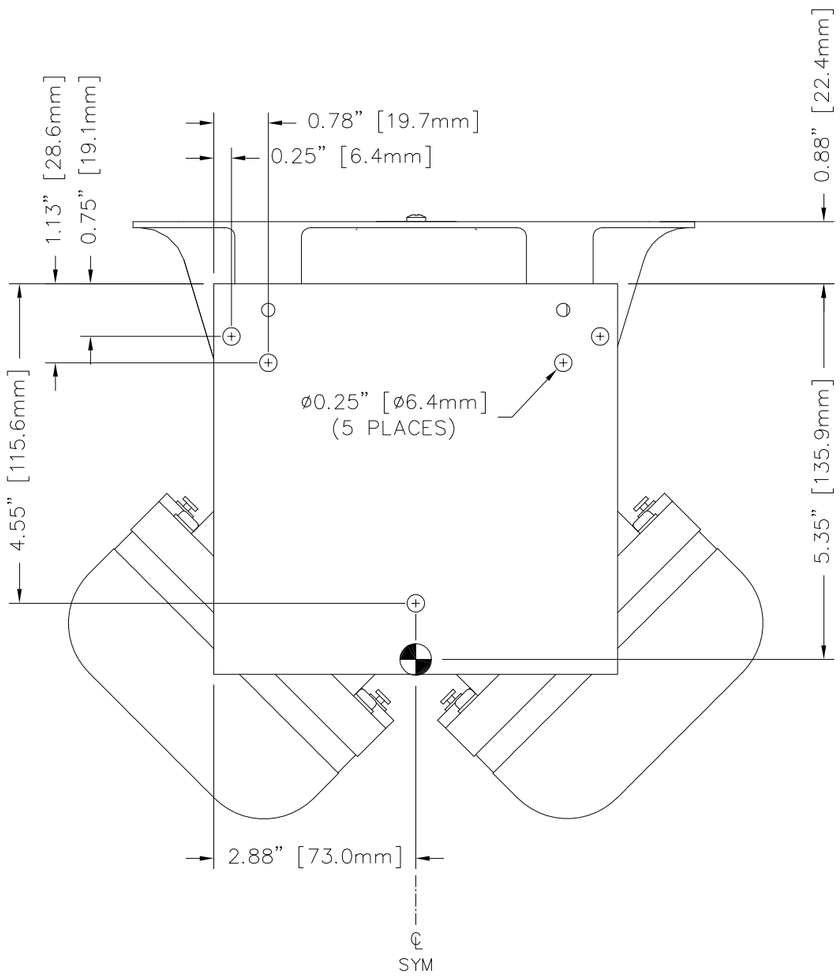
MATERIAL/FINISH

*nat NORTHERN AIRBORNE TECHNOLOGY LTD.

DESIGNED BY	DESCRIPTION		
–	DRILL PATTERN		
DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
T. MASTERS	–	MOUNTING DIAGRAM	1/1
APPROVED BY	DRAWING NUMBER	FILE NUMBER	
NAT R&D	TS200\920−0	TS200\920−0100	







CENTER OF GRAVITY ±0.05

WEIGHT: 17.3 lbs. (7.85kg)

PROPRIETARY AND CONFIDENTIAL TO NAT LTD.

TOLERANCES UNLESS STATED OTHERWISE 0.X=+/−0.030 0.XX=+/−0.010 0.XXX=+/−0.005 0.XXXX=+/−0.002 ANGLE=+/− 0.5 DEG.	DIMENSIONS IN INCHES THIRD ANGLE PROJECTION	DESIGNED	–	nat NORTHERN AIRBORNE TECHNOLOGY LTD.			
		DRAWN	MWS				
		DATE	JAN 24/00	TITLE	EXTERNAL HORN, 200 WATT		
		CHECKED	NAT PROD 112 NAT 223				
MATERIAL		APPROVED	NAT 107	SIZE B	CAGE CODE 3AB01	PART NO. TS200	REV. 1.00 / SHEET 1/1
FINISH		FILE 922−0100.DWG		DWG. TYPE MECH. INSTALLATION		DWG. NO. TS200\922−0	

Section 3 Operation

3.1 Introduction

Information in this section consists of the functional and operational procedures for the TS100 and TS200 Series PA Speakers.

3.2 General

The TS100 and TS200 Series PA Speakers are lightweight loudspeakers that can be used for both internal and external aircraft applications. The TS100WR/TS200WR Series PA Speakers are used with the PA110, PA220 and PA250 series amplifiers.

3.3 Operation Specifics

The TS100/200 Series Speakers have no normal user operational aspects.

3.3.1 Cautions

Do not operate the equipment in a hangar or in confined areas.

Do not operate the equipment with snow, water or other foreign matter in the loudspeaker horn.

Do not clean the loudspeaker with compressed air.

Be careful only to operate the siren for 3 cycles at a time and trill for a short 2 to 3 second burst. The driver is unable to withstand constant signals – it requires a Duty cycle to permit the unit to cool down.

End of section 3

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